



Institut "Jožef Stefan", Ljubljana, Slovenija



center za prenos tehnologij in inovacij
na Institutu "Jožef Stefan"

Licensing opportunity

Method for coating titanium vascular stent, artificial heart valves and other medical devices

Field of use

Technology Keywords:
Cardiology, vascular stents, surface treatment, nanostructuring, plasma

Current state of technology

Stage of development:
Available for demonstration.

Patent status

Patent(s) applied for but not yet granted

Publication

TBA

Developed by

Jožef Stefan Institute

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Background

A Slovenian research institute offers technology for surface treatment of titanium vascular stents and other medical devices. The developed method reduces adhesion and activation of platelets on medical devices. Surfaces produced can be used for stents and artificial heart valves in order to reduce thrombus reactions on the implant material surface. Producers of vascular stents and other medical devices are sought for licence or technical cooperation agreement.

Description of the Invention

The major cause of mortality in the modern world is coronary artery disease. The majority of percutaneous coronary interventions involve stents, which are implemented in order to help enlarge the lumen wall, restore the blood flow through the affected vessel and thus decrease the risk of a heart attack. In the blood the clumping or aggregation of platelets in the blood leads to the formation of a thrombus which obstructs the flow of blood through the circulatory system and thus leads to cardiovascular disease and increases the risk of heart attack.

There are two main types of stents: drug-eluting stents (DES) and bare metal stents (BMS). In the last few years adverse clinical data linking DES usage to arterial thrombosis had led to a large decrease in sales. Furthermore, companies are seeking to develop novel stents, while so far the improvements on DES are merely incremental. Innovations are done mostly on the polymer coatings, stent platforms and in drug components. Moreover DES are almost three to four times more expensive compared to bare metal stents (BMS).

The very promising properties of titanium and titanium alloys, specifically high biocompatibility, resistance to body fluids, great tensile strength, flexibility and high corrosion resistance, have ensured their successful and extensive use as biomaterials. Success of stents depends mainly on avoiding the aggregation of platelets in the blood vessels. Research in the field of nanomaterials has revealed that the topography is a crucial factor for appropriate biological response and the need to produce such surfaces for desired biological response could be the solution.

A group of scientist from Slovenian research institute, specialized in surface engineering, has developed a method that enables appropriate surface conditioning, which highly reduces adhesion and activation of platelets on the stents. In detail the method involves:

- 1.) nanostructuring the surface of titanium by electrochemical anodization and
- 2.) subjecting the nanostructured surface to neutral oxygen atoms to eliminate surface induced thrombotic reactions.



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The titanium nanostructured surfaces produced by the developed method of invention have appropriate chemical structure and topography which reduces the risk of thrombosis on blood contacting devices. The method has been tested in laboratory using blood samples, where platelet adhesion was studied on plain titanium and on surface modified by newly developed method. According to microscopic analysis on samples done by the newly developed method the platelet adhesion is prevented, as practically no platelets were observed on the surfaces prepared by this method.

Slovenian research institute is looking for producers of devices for vascular surgery such as vascular stents, heart valves and similar medical devices. The technology is ready to be licenced to a company, which would use the technology to improve the properties of the vascular stents and other medical devices. Slovenian research institute is looking also for technical cooperation agreement with companies that wish to further develop the technology in cooperation with the institute. In the later case, the company would set additional requirements for the coating technology, which would be adjusted and tested.

Main Advantages

- The developed method highly reduces adhesion and activation of platelets on the stents
- Surface treatment of vascular stents prevents formation of a thrombus and thus decreases risk of cardiovascular disease and heart attack
- The method is applicable on bare metal stents (BMS) which are three to four times less expensive than drug-eluting stents (DES)